Pleasant Hill Road Multipurpose Pathway

Project Time Line:

Total Estimated Project Construction Cost	$3,000,000
Completion of Construction Bid Documents	Early 2023
Road Construction Project Begins	Project is currently un-funded

The City of Lafayette is in the preliminary design phase of a project to create a center median multipurpose pathway on Pleasant Hill Road from Mount Diablo Boulevard to Stanley Boulevard. The pathway will provide for a protected route along Pleasant Hill Road that bypasses the existing on and off ramps to Highway 24. The pathway will be 14 feet wide and separated from vehicle traffic by vertical concrete barriers on either side. In locations where additional width is available landscaping will be added between the pathway and the traffic barriers. Funding for the design of this project has been provided through a grant from the state. Funding for the construction of the project has not yet been obtained. However, grant funding will be pursued as well as private donations through Safe Route to Acalanes High School 501(c)3 organization https://www.saferouteto.org/).

Summary of Major Design Elements and Impacts:

1. The majority of the project is located within Caltrans right of way and approvals for the final design and construction will be required from Caltrans.
2. Pathway footprint will be 14 feet wide with a 10 foot pathways striped with 2 foot shoulders on each side and separated from traffic by vertical concrete barriers.
3. Landscaping will be incorporated into the design where right of way is available (primarily near the intersection with Mount Diablo Boulevard).
4. The project will eliminate parking on both sides of Pleasant Hill Road from Mount Diablo Boulevard to Stanley Boulevard.
5. The project will eliminate the bike lane and shared lane markings on Pleasant Hill Road and bikes will be directed to the center median. Cyclists that are comfortable ridding with traffic will still be permitted to ride in the lanes of Pleasant Hill Road as allowed by the motor vehicle code.
6. Access to the center median pathway will only be provided at the intersections of Mount Diablo Boulevard and Stanley Boulevard / Deer Hill Road.
7. The dedicated right turn lane from northbound Pleasant Hill Road to Stanley Boulevard (at the Shell Station) will be eliminated and the existing adjacent through lane reconfigured to a through / right lane.
8. The project proposes to add a scramble pedestrian/bike phase to the Stanley Boulevard/Deer Hill Road and Mount Diablo Intersections with Pleasant Hill Road.
9. Traffic Impacts have been analyzed by Kittelson and Associates. Traffic volumes used in the analysis were derived by looking at the existing traffic counts and growing them 25% to bring them into line with traffic counts from pre-covid conditions (Terraces traffic counts performed in 2018). The full traffic study prepared by Kittelson and Associates is available on the City's website. In general, the elimination of the dedicated right turn lane from northbound Pleasant Hill Road to Stanley Boulevard without a scramble phase being added to the intersections results in relatively minor increases in delay with a maximum increase in delay of 31 seconds in the am peak hour and 43 seconds in the pm peak hour. The addition of a scramble phase will create more significant delays with a maximum increase in delay of 50 seconds in the am peak hour and 147 seconds in the pm peak hour. It should be noted that this represents a worst case scenario.

Project Engineer Contact Information

Matt Luttropp, Engineering Services Manager, PH #299-3247, Email: mluttropp@ci.lafayette.ca.us

Vehicle Delay and Queue Analysis

Pleasant Hill Road at Deer Hill Road/Stanley Boulevard

Baseline Conditions

- **Overall Intersection Operations** – The intersection currently operates acceptably during the AM peak period with drivers experiencing about 46 seconds of delay on average. However, during the PM peak period, delay reaches over 80 seconds as the demand exceeds the intersection's capacity.

- **Pleasant Hill Road Approaches** - During the AM peak period, vehicle delay for northbound and southbound through and right movements are relatively low, ranging from 25 to 50 seconds. Left turn movements for both northbound and southbound vehicles see longer delays of around 1 minute, 10 seconds. 95th percentile vehicles queues[1] are longest for the through movements, with the northbound through movement seeing about 450 feet (about 18 vehicle lengths) and the southbound queue seeing about 1,075 feet (about 43 vehicle lengths).

  During the PM peak period, operations for the northbound through movement degrade considerably, with delay reaching almost 2 minutes, 30 seconds. This movement also sees the longest queue during the PM peak hour, reaching back about 1,575 feet (63 vehicle lengths), possibly to the CA-24 WB loop ramps. Other movements see delays similar to those seen during the AM peak hour.

- **Deer Hill Road/Stanley Boulevard Approaches** - During the AM peak period, delay for eastbound movements range from 61 to 63 seconds and delay for westbound movements range from 62 to 73 seconds. Eastbound 95th percentile queues range from 200 to 250 feet (8 to 10 vehicle lengths) and westbound queues range from 200 to 350 feet (8 to 14 vehicle lengths).

  During the PM peak period, delay for eastbound movements range from 39 to 49 seconds, and delay for westbound movements range from 59 to 63 seconds. The eastbound approach sees higher queues during the PM peak period, reaching back 525 feet (21 vehicle lengths) for the left turn movement, far exceeding the storage provided by the dual left turn lanes.

Concept #1 (Staged Crosswalk Signal Phasing)

- **Overall Intersection Operations** – Concept #1 results in a slight increase in overall intersection delay compared to existing conditions. On average, drivers would expect to see less than 2 seconds of added delay during the AM peak hour and about 7 seconds of added delay during the PM peak hour. Signal timing was optimized to account for the removal of the exclusive northbound right turn lane, but the cycle length remained the same as existing conditions for both peak periods. Additional discussion of operations on each approach under Concept #1 is summarized in the following bullets.

- **Pleasant Hill Road Approaches –** During the AM Peak hour, delay for each northbound movement (northbound left-turn, northbound through, and northbound right-turn) would increase by 3 to 9 seconds. Delay on the southbound left-turn movement would increase by 8 seconds while delay for the other two southbound movements (southbound through and southbound right-turn) would decrease slightly. The 95th percentile queues for the northbound through/right movement would extend an additional 225 feet (about 9 vehicle lengths), possibly stretching past Acalanes Avenue. The vehicle queue lengths on the other movements would increase or decrease by about 1 vehicle length (25 feet).

  During the PM peak hour, delay for drivers on the northbound approach would not change. Delay on the southbound left-turn movement would increase by 22 seconds. Delay for the other southbound

[1] A 95th percentile queue length represents the length (in feet or vehicle lengths) of vehicles stopped at an intersection that would not be exceeded in 95% of signal cycles. In general, it represents the "worst-case scenario" for traffic queues. In this report, any reference to "queues" refers to 95th percentile queue lengths.

movements (southbound through and southbound right-turn) would change by less than 2 seconds. Similar to the AM peak hour, during the PM peak hour, queues on the northbound through/right movement would increase by about 9 vehicle lengths and queues on the other movements would increase or decrease by about 1 vehicle length (25 feet).

- **Deer Hill Road/Stanley Boulevard Approaches** – Automobile delay and queuing for eastbound movements is expected to remain the same as under existing conditions. Drivers traveling westbound on Stanley Blvd would experience minimal changes to delay and queueing during the AM peak hour. During the PM peak hour, delay for westbound left and through movements would increase by about 20 seconds, and delay for westbound right turn movements would increase by 80 seconds, from about 63 seconds to 143 seconds. The 95th percentile westbound queue lengths would extend an additional 1 to 4 vehicle lengths (25 to 100 feet) during the PM peak hour.

Concept #2 (Pedestrian Scramble Signal Phasing)

- **Overall Intersection Operations** – Concept #2 results in worse vehicle operations performance than existing conditions and Concept #1. On average, drivers would see approximately 22 seconds of added delay during the AM peak hour and about 86 seconds of added delay during the PM peak hour. The length of the signal cycle increases from 150 seconds to 170 seconds in the AM peak period and from 135 seconds to 180 seconds in the PM peak period. An additional signal phase was added to accommodate the exclusive pedestrian movement and timing was optimized. Additional discussion of operations on each approach under Concept #2 is summarized in the following bullets.

- **Pleasant Hill Road Approaches -** Drivers traveling northbound or southbound on Pleasant Hill Road would experience substantial changes in delay and queue lengths during both the AM and PM peak hours compared to existing conditions.

  During the AM peak hour, drivers making a northbound left turn at the intersection would experience an additional 35 seconds of delay; northbound drivers traveling through or turning right would experience about 20 more seconds of delay. Southbound left and through movements would experience increases of between 24 and 26 seconds, and the southbound right turn would experience an increase of about 8 seconds. The 95th percentile queues would increase by about 375 feet (or about 15 vehicle lengths) for northbound through/right movements and 275 feet (or about 11 vehicle lengths) for southbound through movements. Southbound left queues increase by about 75 feet to a total of 350 feet, possibly extending past the available left turn pocket storage.

  During the PM peak hour, delays on the northbound through and southbound left-turn movements that experience the highest delay under existing conditions would increase by about 2 minutes (northbound through) and over 3 minutes (southbound left). The 95th percentile northbound through/right queues would increase by over 1,000 feet (or 42 vehicle lengths). It is likely that drivers would select an alternate route if delays worsened to this degree. For example, drivers that exited the freeway at this location (1,115 northbound vehicles) may choose to exit at a different location if they observed or experienced this level of queue spillback and delays on Pleasant Hill Road.

- **Deer Hill Road/Stanley Boulevard Approaches** – During the AM peak hour, the westbound left and through movements would experience about 45 additional seconds of delay, with the 95th percentile queues increasing by about 100 feet (or 4 vehicle lengths). Drivers traveling eastbound would experience an increase of between 13 to 18 seconds of delay, depending on the movement, and an increase in queue length of around 50 feet (2 vehicle lengths).

  During the PM peak hour, delay for westbound drivers would increase by between about 2 minutes (left and through movements) to almost 4 minutes (right turn movement). Queues increase for eastbound and westbound approaches between 75 and 250 feet (3 to 10 vehicle lengths), potentially stretching past the second driveway to Acalanes High School on the westbound approach on Stanley Blvd.

Pleasant Hill Road at Mt Diablo Boulevard

Baseline Conditions

- **Overall Intersection Operations** - The intersection currently operates acceptably during both the AM and PM peak periods with drivers experiencing between 22 (AM) and 29 seconds (PM) of delay on average.

- **Pleasant Hill Road Approaches** - During the AM peak hour, vehicle delay for northbound and southbound through and right movements are relatively low, ranging from 6 to 17 seconds. The northbound left turn movement sees longer delays of around 49 seconds. Vehicles queues range from 125 feet (5 vehicle lengths) for the northbound through movement to 300 feet (12 vehicle lengths) for the northbound left turn, which extends into the intersection with Old Tunnel Road.

  Traffic operations during the PM peak period are similar to the AM peak period. Delay for the northbound through, northbound right, and southbound through movements are all below 26 seconds, and delay for the northbound left turn reaches about 40 seconds. Queuing is also similar to the AM peak period, ranging from 175 feet (7 vehicles lengths) for the northbound through movement to 225 feet (9 vehicle lengths) for the northbound left turn.

- **Mt Diablo Boulevard Approach** - Vehicles approaching the intersection from Mt Diablo Boulevard experience between 46 and 48 seconds of delay during the AM peak period for all movements. Maximum queues extend about 225 feet (9 vehicle lengths); given that there is room for approximately 8 vehicles (200 feet) to queue in the eastbound left-turn lane, queues may occasionally extend beyond the turn pocket.

  During the PM peak period, eastbound through and eastbound right movements experience 44 and 49 seconds of delay, respectively, and left turn movements experience 29 seconds of delay. Similar to the AM peak period, the left turn storage area (200 feet or 8 vehicles) may not be able to contain the maximum left turn queue lengths (225 feet or 9 vehicle lengths). Queuing for the eastbound through and eastbound right turns are higher than during the AM peak period, extending 400 feet (16 vehicles) and 375 feet (15 vehicles), respectively.

Concept #1 (Staged Crosswalk Signal Phasing)

- **Overall Intersection Operations –** Concept #1 results in minor changes to overall intersection operations. On average, drivers would expect to experience less than 5 seconds of added delay during the AM peak hour and about 4 seconds of added delay during the PM peak hour. During the both the AM and PM peak periods, increases in 95th percentile queue length on the eastbound approach may extend beyond the existing left-turn pocket and block the through travel lane.

  To reduce the delays and risk of rear-end crashes that may result from queue spillback, the left turn pocket could be extended by an additional 100 feet, providing 300 feet of storage (12 vehicle lengths), which would better accommodate queues. Additional evaluation would need to be conducted to assess the feasibility of removing the existing landscaped median while optimizing signal timing to manage queues.

- **Pleasant Hill Road Approaches -** During the AM peak period, delay for northbound movements increases by about 4 to 13 seconds and delay for southbound movements would increase by about 5 seconds. The 95th percentile queue lengths would increase by 1 to 3 vehicle lengths (25 to 75 feet).

  During the PM peak period, delay *decreases* slightly for all movements except for the northbound left, which would increase by about 17 seconds. The 95th percentile queues increase by between 1 and 2 vehicle lengths (25 to 50 feet).

- **Mt Diablo Boulevard Approach –** During the AM peak hour, drivers making a left turn from Mt Diablo Blvd to Pleasant Hill Road would experience an increase in delay of about 24 seconds and an

increase in queue lengths of about 2 vehicles (50 feet). The other movements would have slightly shorter delays and queues than under existing conditions.

During the PM peak hour, drivers making an eastbound left turn would experience about 43 additional seconds of delay compared to existing conditions. The 95th percentile queues would extend an additional 6 vehicle lengths (150 feet) to 375 feet (15 vehicle lengths). Given that there is room for approximately 8 vehicles (200 feet) to queue on the eastbound approach, queues may extend beyond the turn pocket and block the through lane. Delay for the other movements (eastbound through and eastbound left) decreases slightly and queues increase by about 25 feet (1 vehicle).

Concept #2 (Pedestrian Scramble Signal Phasing)

- **Overall Intersection Operations –** Concept #2 results in worse vehicle operations performance than existing conditions and Concept #1. On average, drivers would expect to experience approximately 9 seconds of added delay during the AM peak hour and about 16 seconds of added delay during the PM peak hour. During the AM and PM peak hour, delays for drivers on the northbound approach would increase by 6 seconds (AM) and 12 seconds (PM), the southbound approach by 5 seconds (AM) and 12 seconds (PM), and the eastbound approach by 18 seconds (AM) and 24 seconds (PM).

  Similar to Concept #1, increases in 95th percentile queue length on the eastbound approach may extend beyond the existing left-turn pocket and block the through travel lane. The turn pocket could potentially be extended by up to 100 feet. Additional evaluation would need to be conducted to assess the feasibility of removing the existing median and optimizing signal timing to manage queues.

- **Pleasant Hill Road Approaches** - Increases in delays for northbound and southbound through movements (compared to existing conditions) are less than 10 seconds during the AM and PM peak hours. Delay impacts for the northbound left-turn movement are more substantial, with increases of 20 and 24 seconds during the AM and PM peak hours, respectively. Queue lengths in the northbound left-turn lane would increase by an additional 100 feet, extending well beyond the Old Tunnel Road intersection.

- **Mt Diablo Blvd Approach** - During the AM peak hour, eastbound drivers approaching Pleasant Hill Road would experience an increase in delay of about 17 to 19 seconds and an increase in queue lengths of about 2 to 3 vehicles (50 to 75 feet) during the AM peak hour.

  During the PM peak hour, eastbound drivers would experience about 17 (left turn movement) to 27 (right turn movement) additional seconds of delay compared to existing conditions. The 95th percentile queues for the eastbound left turn would extend an additional 125 feet for a total queue length of about 350 feet (14 vehicle lengths). Given that there is room for approximately 8 vehicles (200 feet) to queue on the eastbound approach, queues may extend beyond the turn pocket and block the through lane. Queues would extend an additional 7 to 8 vehicles (175 to 200 feet) for eastbound through and right movements.

Changes to Travel Time

Changes to travel time were estimated by summing the expected changes in delay for consecutive movements along each route for the concepts and existing conditions. As shown in the following table, Concept #1 would result in minor changes to travel times of less than 10 seconds on most routes during the AM and PM peak hours and a maximum increase in travel times of up to 43 seconds for drivers making an eastbound left-turn at Mt Diablo Boulevard and continuing north through Deer Hill Road/Stanley Boulevard during the PM peak hour. Concept #2 would increase travel times by between 18 and 50 seconds during the AM peak hour and by between 27 and 147 seconds during the PM peak hour.

Scenario	Route/Movements	Concept #1 Increase in Travel Time (Sec/Veh)	Concept #2 Increase in Travel Time (Sec/Veh)
AM PEAK HOUR	NB Thru @ Mt. Diablo Blvd; NB Thru @ Deer Hill Rd/Stanley Blvd	14	26
	SB Thru @ Deer Hill Rd/Stanley Blvd SB Thru @ Mt. Diablo Blvd;	2	29
	EB Left @ Mt Diablo Blvd; NB Thru @ Deer Hill Rd/Stanley Blvd	31	38
	EB Right @ Deer Hill Rd; SB Thru @ Mt Diablo Blvd	5	18
	WB Left @ Stanley Blvd; SB Thru @ Mt Diablo Blvd	7	50
PM PEAK HOUR	NB Thru @ Mt. Diablo Blvd; NB Thru @ Deer Hill Rd/Stanley Blvd	-1	136
	SB Thru @ Deer Hill Rd/Stanley Blvd SB Thru @ Mt. Diablo Blvd;	-4	29
	EB Left @ Mt Diablo Blvd; NB Thru @ Deer Hill Rd/Stanley Blvd	43	144
	EB Right @ Deer Hill Rd; SB Thru @ Mt Diablo Blvd	0	27
	WB Left @ Stanley Blvd; SB Thru @ Mt Diablo Blvd	20	147